

seven o'clock, with a perfectly clear sky, but only saw two *Andromedes*, no others.

The combination of the observations of this shower in 1872 and 1885 furnishes material for a calculation of the elements of the orbit without the necessity of assuming the mean distance to be the same as that of Biela's Comet. The only assumption I shall make is that, in the interval of thirteen years, the nucleus of the stream has made two complete revolutions.

In 1872, the maximum density of the shower was observed about November 27, 6<sup>h</sup> G.M.T. On the present occasion the maximum would appear to have been about 5<sup>h</sup> or 6<sup>h</sup> G.M.T. The interval is 4748.0 mean solar days, and consequently the periodic time is 2374.0 days with very small error, corresponding to a mean distance of 3.4828.

The radius vector being common to both orbits (neglecting the dimensions of the Earth), the ratio of the orbital velocity of the meteors to that of the Earth is 1.30137 : 1.

The radiant points in the following table were determined with as much precision as is possible in such observations:—

	I. Nov. 26, 10 <sup>h</sup>	II. Nov. 27, 6 <sup>h</sup>	III. Nov. 27, 6 <sup>h</sup>	IV. Nov. 28, 9 <sup>h</sup>	V. Nov. 30, 7 <sup>h</sup>
Denning ...	26°7' + 43°5'	24° + 43°5'	23° + 45°	22° + 43°5'	21° + 42°5'
Tupman (9 <sup>h</sup> )		27 + 44	22.5 + 45.5		

These positions and the mean distance and ratio of velocities above give the following orbits. The time of perihelion passage is shown for comparison with the presumed time of perihelion passage of Biela's Comet:—

	I. Dec. 27 <sup>d</sup> .9	II. Dec. 27 <sup>d</sup> .8	III. Dec. 26 <sup>d</sup> .7	IV. Dec. 26 <sup>d</sup> .7	V. Dec. 27 <sup>d</sup> .0	Biela's Comet (A) Oct. 31?
Ω...	244°9'	245°7'	245°7'	246°8'	248°8'	246°3'
π...	112°2'	111°1'	109°2'	108°2'	107°3'	109°6'
i...	13°1'	13°0'	13°6'	12°5'	11°6'	12°6'
ε...	.7556	.7532	.7508	.7470	.7432	.7559
q...	.851	.860	.868	.881	.895	.861
2a-q	6.114	6.106	6.097	6.085	6.071	6.191
Motion ...	D	D	D	D	D	D

*Andromeda Meteors.* By J. Rand Capron.

The display to which attention was drawn by circular from Dun Echt took place on the 27th, but earlier in the evening than was anticipated. It commenced soon after dusk and lasted till 9 P.M., when clouds and rain prevented further observations. Ten time records were taken at intervals at Guildown, and three other local ones have been communicated to me. At times the stars fell almost continuously, and occasionally three or four at

a time. As the result of actual countings of portions of the sky, the estimated general rate for all parts was found to be as follows :—

P.M.	...	...	Per minute.	P.M.	...	...	Per minute.
6			10	8.30			25
7.20			22	9.0			26
7.50			29				

A few of the observations when the shower was thickest gave forty to fifty per minute.

Except for a short interval about 7.30, there was always cloud and mist to some degree, so that the countings and estimates are possibly under the mark. The estimated proportion of large meteors was 1 in 10. These were white, with long yellow, or reddish-yellow trails, and three to four times the size and brightness of *Jupiter*. The intermediate ones in size were also white. The smaller stars often appeared of a bluish and some of a yellow, or yellow-red tint. A considerable proportion of the meteors were referred to the radiant point, but frequently they were scattered all over the sky, and not so easily traced. At intervals they seemed more numerous in particular quarters, notably E. and W., and two observers to different points would differ considerably in their countings. The numbers observed overhead did not seem larger than elsewhere. At 9 P.M. on the 28th three large ones were observed.

Table of Observations of Andromeda Meteors, November 27, 1885, at Guildown, and two other places.\*

Time.	State of weather.				Obs.	Time of Counting.	No. observed.	Direction.
P.M.						m		
6	Partly thick	...	...	...	C.	5	25	N.
6	"	...	...	...	L.	$\frac{1}{4}$	5	N.
7	Much wind. Some seen through clouds							
7.20	Clear	...	...	...	W.	1	11	S. & W.
*7.30	"	...	...	(South Hill)	B <sup>1</sup> .	10	74	N.E.
7.40	"	...	...	...	P.	10	107	S. & W.
	10 larger ones in 67							
7.45	Clear	...	...	...	B <sup>2</sup> .	1	25	N.
7.50	"	...	...	...	P.	5	73	S.
7.50	Clouded	...	...	...	C.	5	12	N.
	Included several large ones							
8.0	Clearing, but part clouded	...			P.	10	68	N.E.
8.5	"	"	...		B <sup>2</sup> .	1	25	E.
*8.15	"	"		(Shere)	E. C.	1	20	?
8.30	"	"	...		P.	10	126	W.
9	"	"	...		C. & P.	5	65	W. & E.

Guildown : 1885, Nov. 28.

*Meteor Shower connected with Biela's Comet.* By the Rev. S. J. Perry, F.R.S.

The evening of November 27 was unfortunately cloudy at Stonyhurst, but it was cloudless until past midnight on the following day, and three observers kept a close watch for the meteors from 9.30 to 11.30, two of them remaining until 2 A.M. Fifty meteors were recorded, nine or ten of which radiated from the point R.  $24^\circ$ ,  $\delta +41^\circ$ , and three other radiant in *Cygnus*, *Perseus*, and *Taurus*, were each fairly marked by four or five meteors. Those from *Andromeda* were of the 3rd or 4th magnitude, and were nearly all seen from 10.35 to 10.47, and from 12.20 to 12.27.

A note just to hand from Malta, gives the following account of the observations made of the meteor stream on the 27th, at St. Julian's Bay, by the Rev. J. Scoles, S.J., director of the Observatory.

"There was a fine display of meteors last night (27th), beginning as soon as dusk set in, attaining a maximum apparently about 7 P.M., and still continuing at 10 P.M. Radiant point very distinct in *Andromeda*, R.A.  $21^\circ$ , N.P.D.  $46^\circ$  approximately. Some of the trails very bright, and remaining visible in some cases for half a minute afterwards. Many were visible for a quarter of a minute. The uniformity of velocity in groups was very remarkable."

*Stonyhurst Observatory:*  
1885, Dec. 8.

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*Notes on the Meteorites of November 27, 1885, as seen at East Tisted Rectory, Alton, Hants.* By Rev. F. Howlett.

A few hours in anticipation of the time indicated in the notice so opportunely published by Dr. Copeland of Lord Crawford's Observatory at Dun Echt, the expected flight of meteorites so mysteriously connected with the orbit of the vanished comet of Biela was seen here for a limited time in great magnificence from about 6<sup>h</sup> to 7<sup>h</sup> 15<sup>m</sup> on Friday evening, November 27, whilst the sky was fairly free from clouds.

The meteorites appeared in such multitudes, in greater or less frequency, that it was simply hopeless for any single observer to attempt correctly to count them, as they radiated from near  $\gamma$  *Andromedæ*, as was predicted, to all parts of the heavens, but chiefly, as it seemed to me, affecting the regions contiguous to *Pegasus*, *Cygnus*, and *Hercules*; though this impression may have been only illusory, and dependent upon the circumstance that the sky was generally clearer in those quarters than in others.

I should certainly say that, though perhaps on the whole not

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